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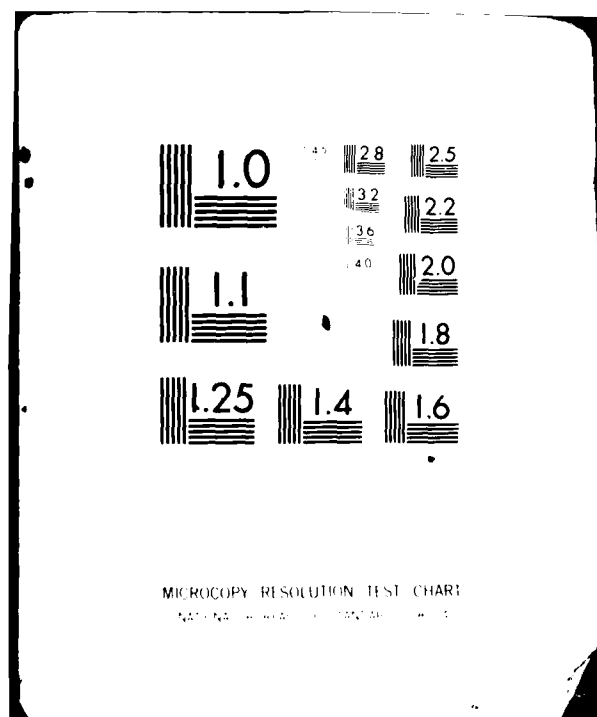
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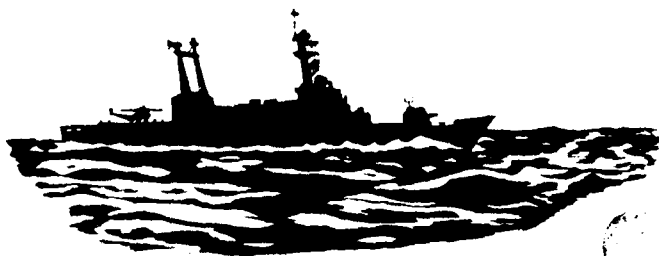
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**OCEANOGRAPHIC OBSERVATIONS**

**NORTH ATLANTIC  
OCEAN STATION BRAVO**

**TERMINAL REPORT**

**1964 - 1974**



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**OCEANOGRAPHIC REPORT No. CG 373-78**

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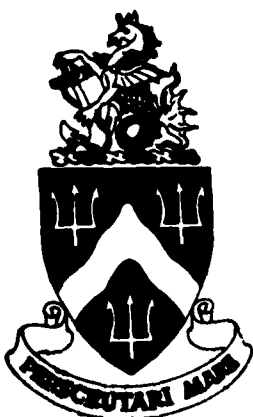
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## **OCEANOGRAPHIC OBSERVATIONS**

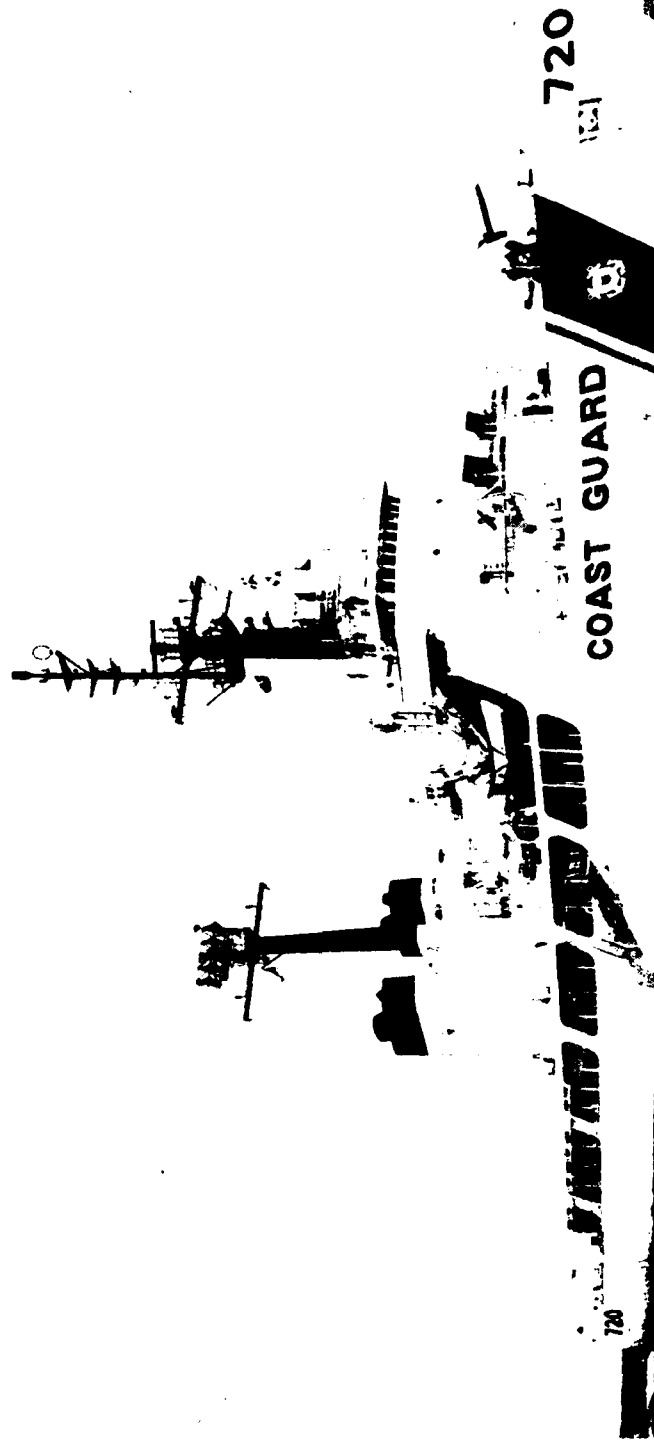
### **NORTH ATLANTIC OCEAN STATION BRAVO TERMINAL REPORT**

**1964 - 1974**

***J. L. Shuhy***

**United States Coast Guard  
Oceanographic Unit  
Washington, D.C.**

**September 1978**

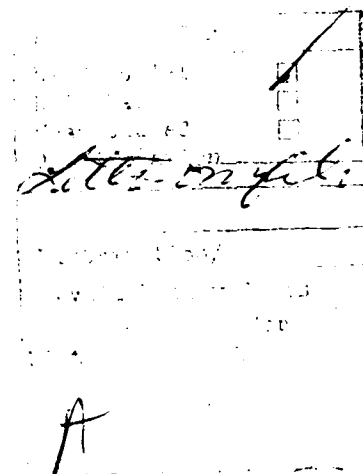


USCG SHERMAN (WMEC-720)

## ABSTRACT

Observed and interpolated temperature and salinity data, plus computed sigma-t, geopotential anomalies, sound velocities and a limited number of dissolved oxygen values are presented for 1249 oceanographic stations taken by U.S. Coast Guard cutters at Ocean Station BRAVO (56°30'N, 51°00'W) from November 1969 through June 1974. In addition, a time-series analysis of monthly averages of air and sea surface temperature, salinity, and sigma-t are presented for data collected at OS BRAVO since the inception of the oceanographic program in January 1964. This analysis reveals a five year cooling and freshening trend of the surface waters between 1967 and 1971 which resulted in a decrease in density of the surface waters. This decrease in density resulted in a stratification of the water column in the upper 200 meters inhibiting an overturn of the water column and the formation of deep and bottom water in this area.

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# OCEANOGRAPHIC OBSERVATIONS NORTH ATLANTIC OCEAN STATION BRAVO TERMINAL REPORT

1964—1974

By

Joseph L. Shuh<sup>1</sup>

## INTRODUCTION

Ocean Station BRAVO was located in the Labrador Sea at 56°30'N, 51°00'W (Fig. 1). A program of daily Nansen casts was established in January 1964 and was conducted as the availability of oceanographic equipment permitted. In January 1966 the oceanographic program was increased to an alternate patrol basis (each patrol lasting 3 or 4 weeks) until March 1968 when oceanographic operations were scheduled on a continuous basis. A Plessey Model 9006N or Model 9040 S/T/D Environmental Profiling System (STD) was used on selected vessels occupying OS BRAVO starting in November 1968. The oceanographic program on OS BRAVO was terminated in June 1974 when the station was disestablished by the Coast Guard. All previous reports on the oceanographic data collected at OS BRAVO are listed under the references. This is the sixth and final report in the series. Although the data presented in Appendix A are for only those cruises not published in the previous reports and covers the period November 1969 through June 1974, the analysis is based on 2230 casts taken at OS BRAVO since January 1964.

## CAST PROCEDURES

Oceanographic data were collected by U.S. Coast Guard cutters either once daily with Nansen bottles or up to 4 times per day with an STD, weather and other operations permitting, while occupying OS BRAVO.

Nansen casts were made to 1500 meters at 14 prescribed levels. Each vessel was also instructed to take one cast to within 50 meters of the bottom during each patrol. Vessels equipped with an STD took two to four casts per day to 1500 meters and

once each week a cast to 3000 meters. Quality control of the STD casts was accomplished by the use of two Nansen bottles; one near surface and one just above the STD at the bottom of each cast. In the event of STD failure during the cruise, the vessel reverted to a program of daily Nansen casts. The interpolated temperatures and salinities for standard depths, sigma-t, specific volume anomalies, and sound velocities were computed by the National Oceanographic Data Center (NODC) and are presented in Appendix A.

The Ocean Station Vessels normally maintained position as close to the center of station as practicable. Those stations taken more than 30 nautical miles from the station center were not included in the computation of the monthly averages presented in this report. A listing of all the oceanographic patrols on OS BRAVO is contained in table 1.

## DISCUSSION

The data from the 126 oceanographic patrols at OS BRAVO span the 10 year period from January 1964 to June 1974. To handle the large quantities of data which were collected during this time, monthly averages of the various parameters were calculated for specific depths. (For a more detailed analysis of the day-to-day variations, see the previous reports). A computer program (ONST) was written for the CDC 3300 computer to calculate these monthly averages. Only that data collected within 30 nautical miles of 56°30'N, 51°00'W were used in the calculations. Monthly averages of temperature, salinity, and sigma-t were calculated for 28 depths between the surface and 3000 meters. In addition,

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the depth of the isotherms at every 1°C, the isohalines at every 0.1‰, and the isopycnals at every 0.1 g/cc were interpolated from the monthly averages.

The sea surface temperature usually reached a maximum in August and a minimum in March. The maximum monthly average sea surface temperature between 1964 and 1974 ranged between 7.08°C and 10.24°C (fig. 2a) which occurred in August 1972 and August 1973 respectively. The minimum monthly average sea surface temperature ranged between 1.59°C and 3.44°C which occurred in March 1971 and April 1967 respectively. The sea surface temperatures generally decreased from 1964 into 1972, being about 2°C colder in 1972 than in 1964; however, there was a sharp rise in temperature in 1973.

The sea surface salinities usually reached a maximum in March and a minimum presumably due to fresh water runoff and advection in September (fig. 2b). From 1964 to the beginning of 1972, there was a dramatic decrease in the salinity of the water at OS BRAVO, especially in the upper 200 meters. Typically the sea surface salinities ranged from a high of about 34.8‰ during March to a low of about 34.5‰ during September. However, during 1971 the surface salinities ranged from about 34.4‰ to 33.8‰ and corresponded to the lower overall sea surface temperature values.

The variation in density ( $\sigma_t$ ) at BRAVO in about the upper 200 meters was primarily controlled by temperature owing to the large annual variations in temperature (typically 5-8°C at the surface) as compared to the annual variations in salinity (typically 0.2-0.6‰). Both the summer warming and freshening of the surface waters contributed to the decrease in the surface density until a minimum of about 26.7 g/cc was reached, usually in August or September (fig. 2c). This decrease in the surface density retarded mixing of the surface resulted in a stratification in about the upper 200 meters of the water column. Winter cooling and an increase in the surface salinities resulted in an increase in the density of the surface waters until a maximum of about 27.7 g/cc was reached usually in March or April. This increase in the surface density prompted mixing of the surface waters. It took about one month for the water column to become thoroughly mixed down to 50 meters, 3 months to mix down to 100 meters, and about 5 months to mix down to 200 meters. Mixing did not appear to occur much below 200 meters.

The surface air temperatures at OS BRAVO (Mariners Weather Log) reached a maximum of about 9°C in August which was about 1 month before the corresponding maximum sea surface temperature (fig. 3a). The minimum surface air temperature was usually more variable and ranged from about -6° to -4°C and usually occurred in February, again about one month before the corresponding minimum sea surface temperature. Except for about 3 months in the summer, the average sea surface temperature was higher than the average air temperature.

During the years 1964 through 1966, the annual variations of temperature and salinity were almost identical. However, starting in 1967 and continuing through 1971 there was a noticeable cooling and freshening of the surface waters. As previously mentioned, the variation in density of the surface waters was primarily controlled by variations in temperature rather than salinity owing to the much larger variations in temperature as compared to salinity. However, the decrease in density resulting from the freshening of the surface waters that accompanied the 1967 to 1971 cooling trend more than compensated for the increase in density caused by the colder surface waters. This resulted in an overall decrease in the surface density which was large enough to impede the mixing of the upper layers of the water column and a much exaggerated temperature and salinity gradient when compared to previous years.

## SUMMARY

The ten year record at Ocean Station BRAVO offers an opportunity to study the annual variations of temperature and salinity in the upper latitudes resulting in a better picture of the types of variations that might be expected.

Of particular interest was the corresponding decrease in surface salinity with the decrease in sea surface temperature. It had been speculated that abnormally cold sea surface temperatures might result in an increase in the surface density and a catastrophic overturn in the water column. These data show quite the opposite, at least during the cooling trend noted from 1967 through 1971. The corresponding decrease in surface salinities more than offset the lower temperatures resulting in stratification rather than an overturn of the water column.

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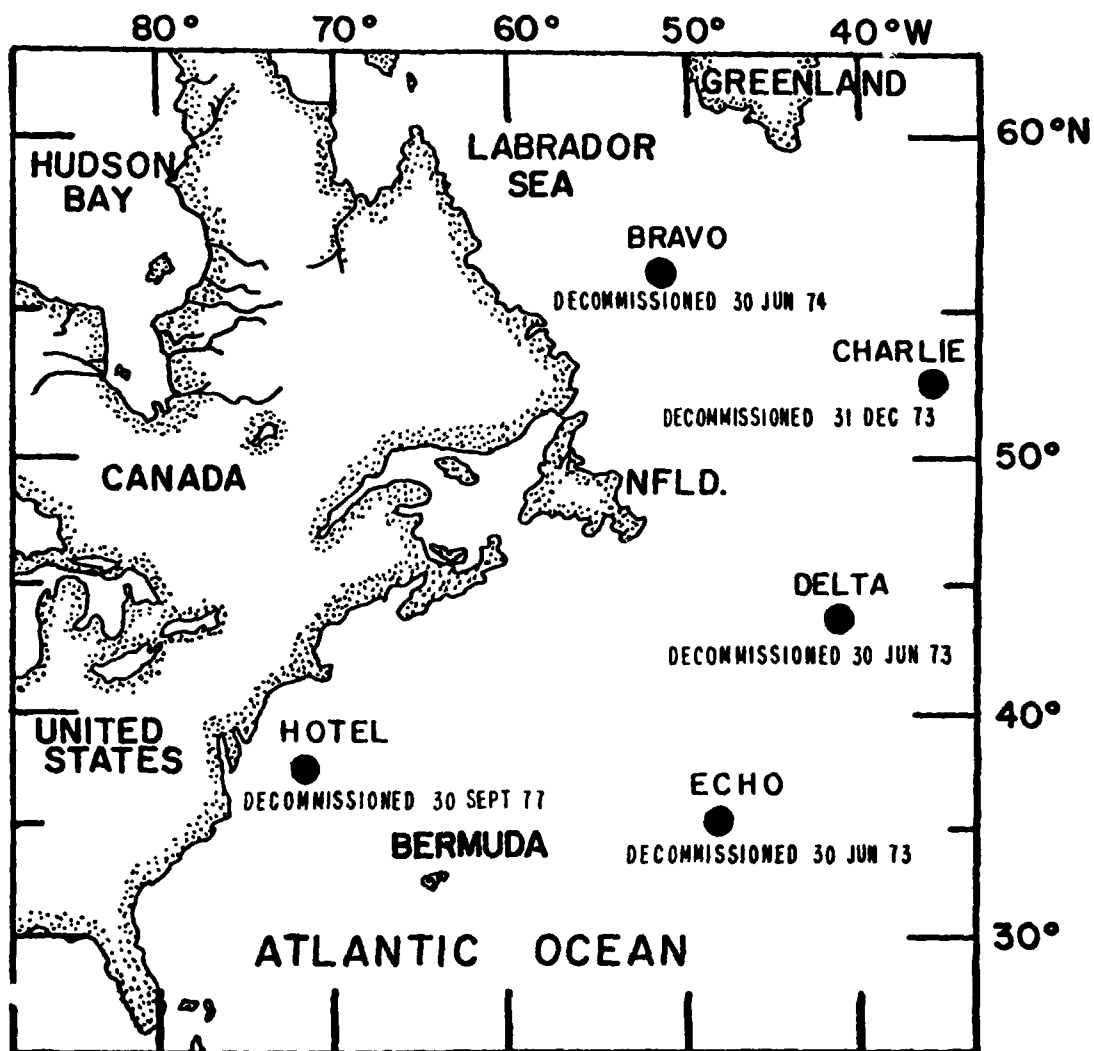


Figure 1.—Chart of the North Atlantic Ocean Stations occupied by U.S. Coast Guard Cutters.

Figure 2.-(a) Monthly averages of temperature ( $^{\circ}\text{C}$ ) at OS BRAVO from January 1964 to June 1974 at selected depths

TEMPERATURE ( $^{\circ}\text{C}$ )

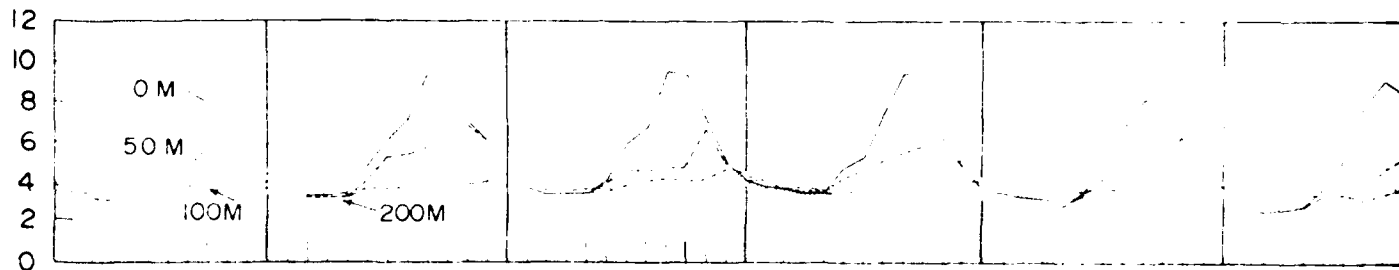


Figure 2.-(b) Monthly averages of salinity ( $\text{‰}$ ) at OS BRAVO from January 1964 to June 1974 at selected depths.

SALINITY ( $\text{‰}$ )

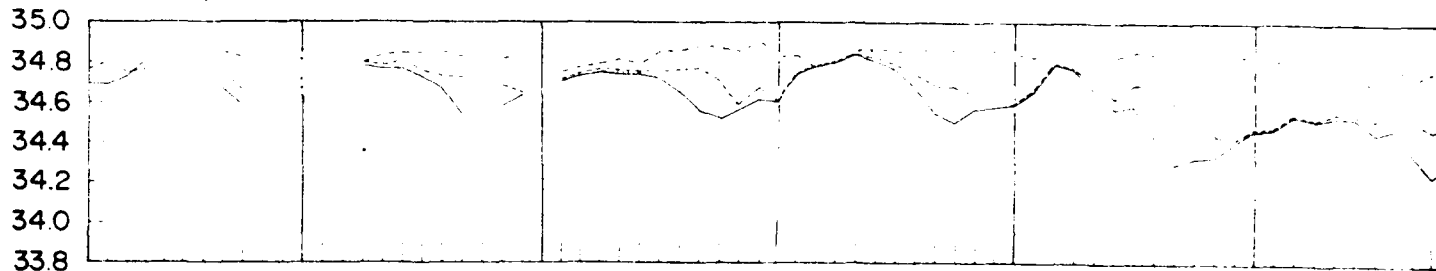
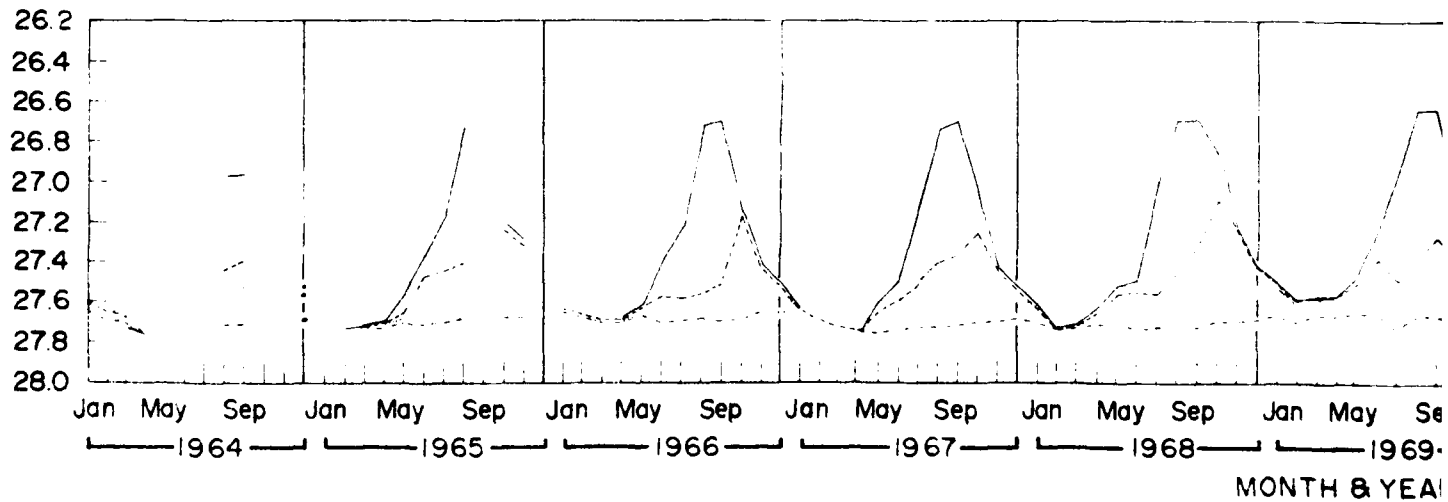
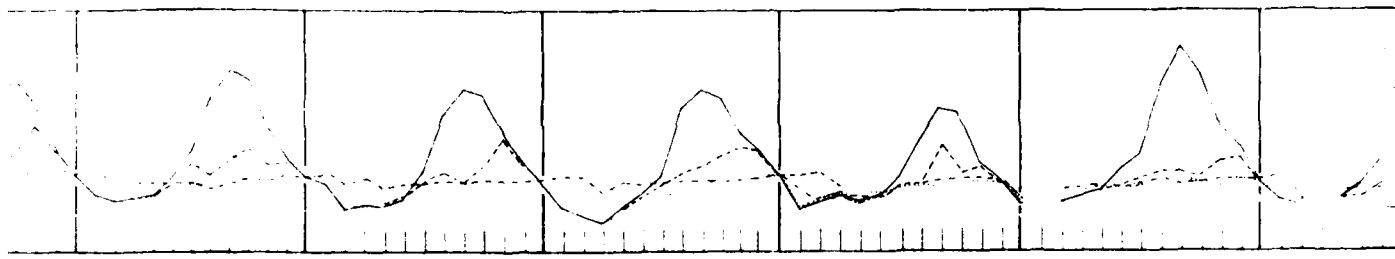


Figure 2.-(c) Monthly averages of density (sigma-t) (g/cc) at OS BRAVO from January 1964 to June 1974 at selected depths.

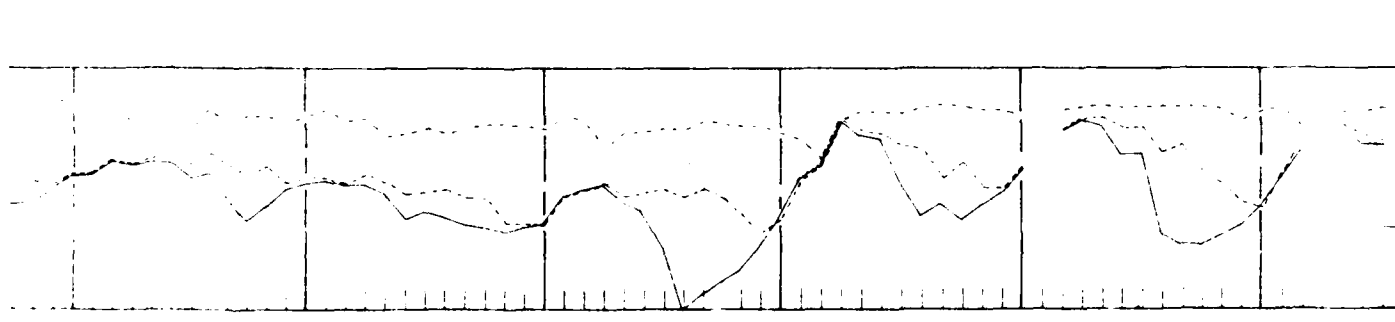
SIGMA-t



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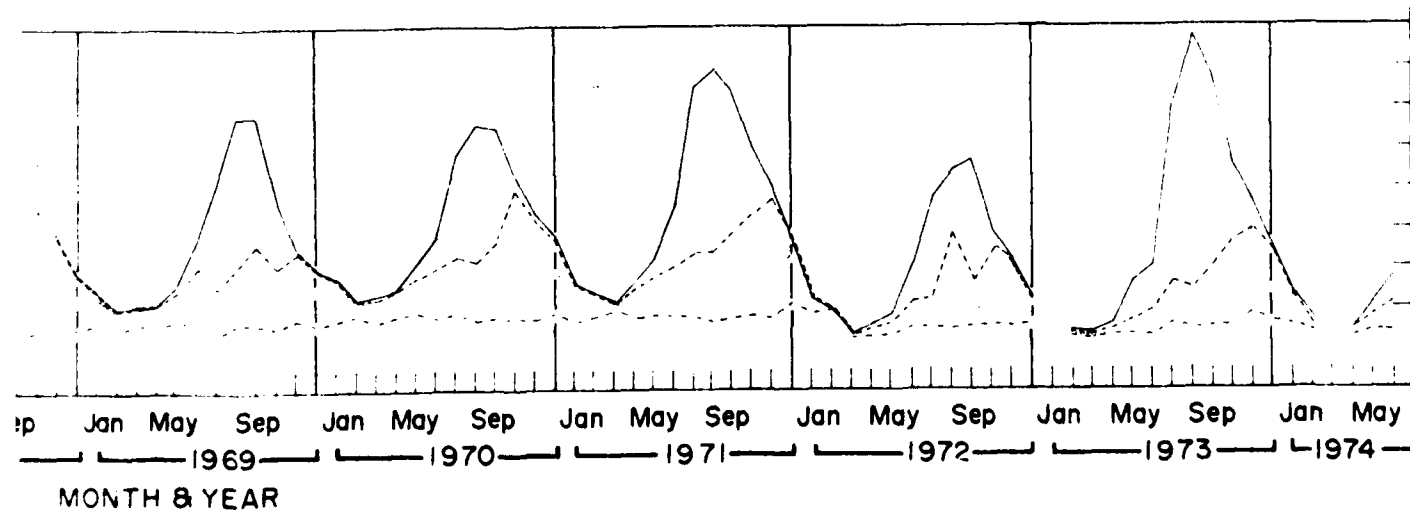


Figure 3.—(a) Monthly averages of surface air temperature (°C) at OS BRAVO from January 1964 to June 1974

**Air Temperature (°C)**

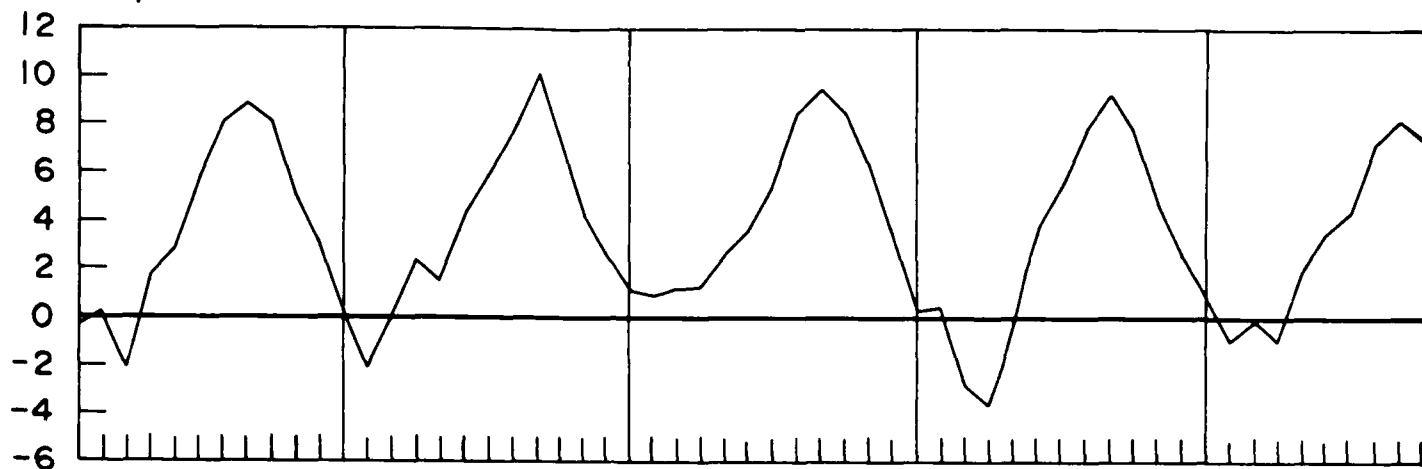
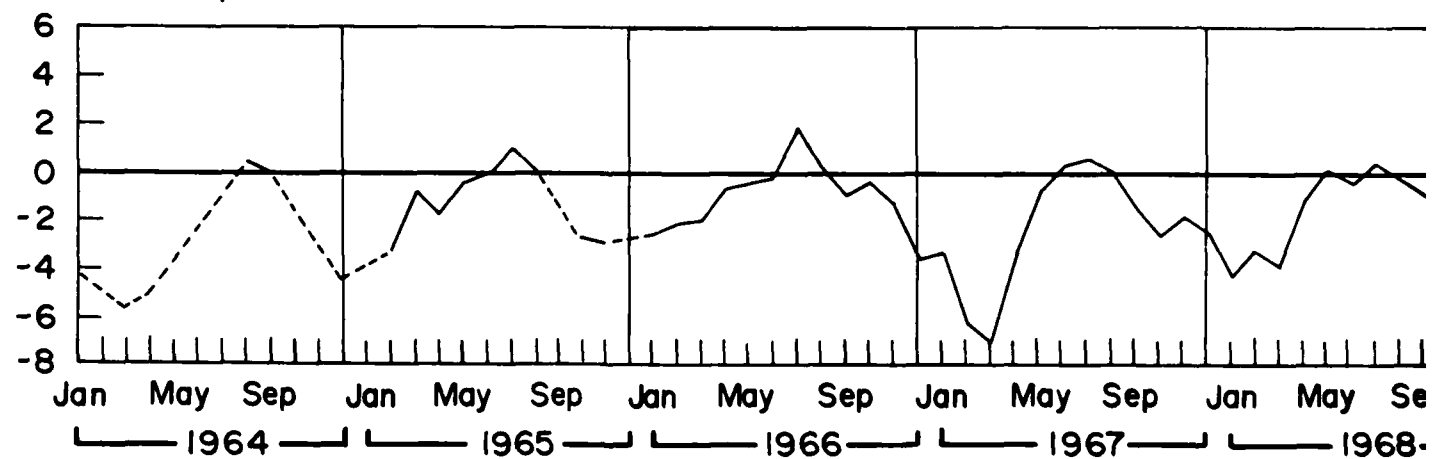


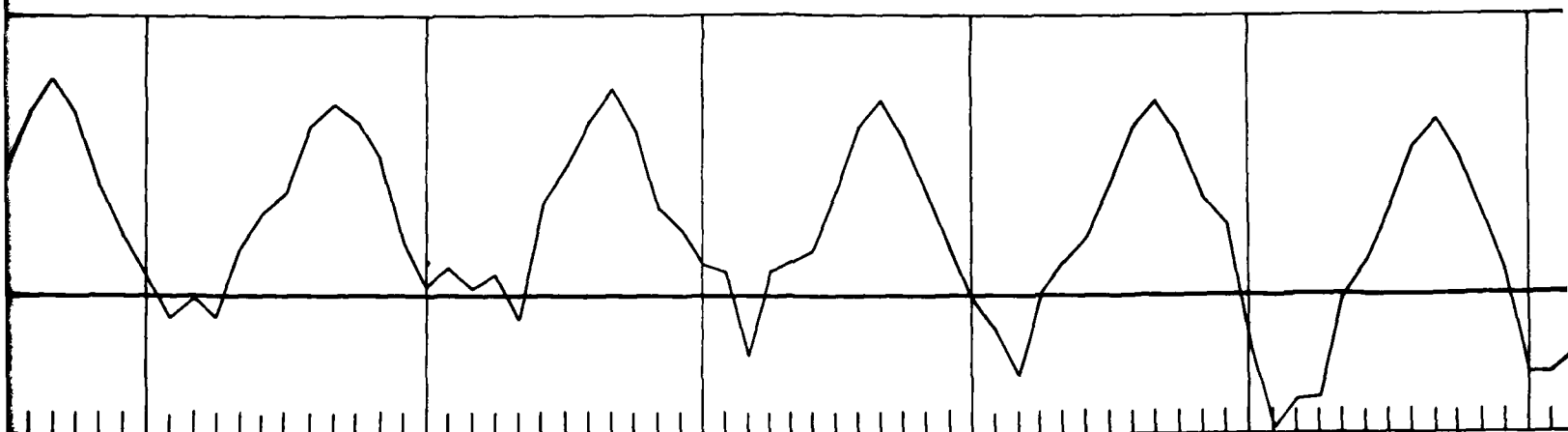
Figure 3.—(b) Difference between monthly average surface air temperature and monthly average sea surface temperature at OS BRAVO from January 1964 to June 1974.

**Air-Sea Temperature (°C)**

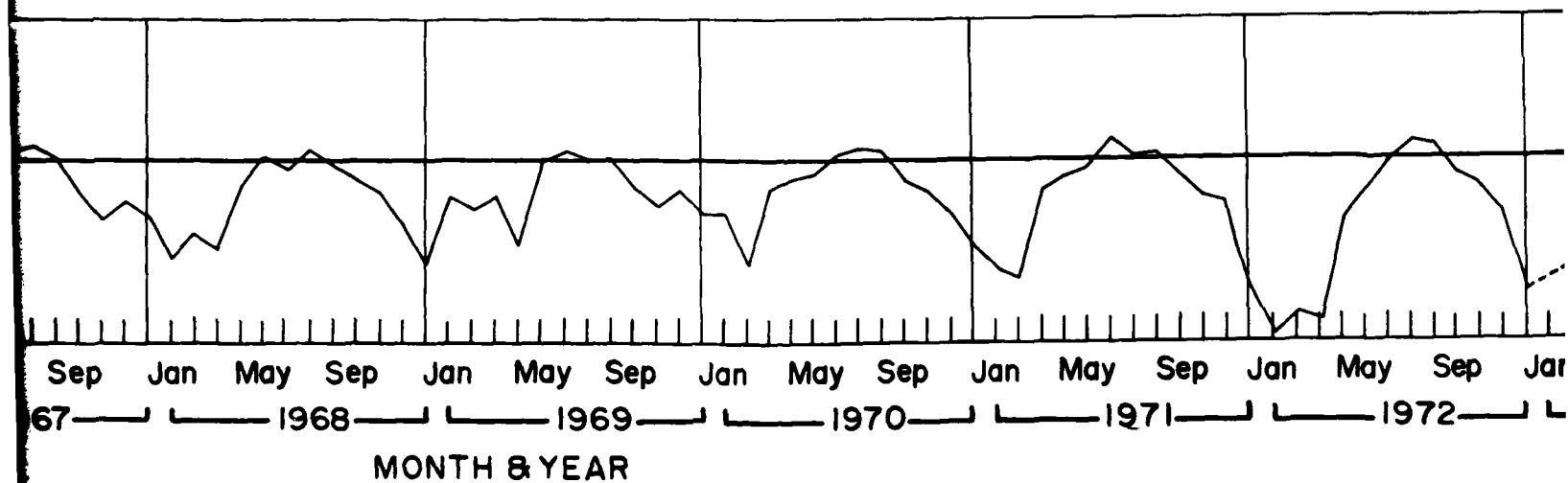




1964 to June 1974



sea surface temperature



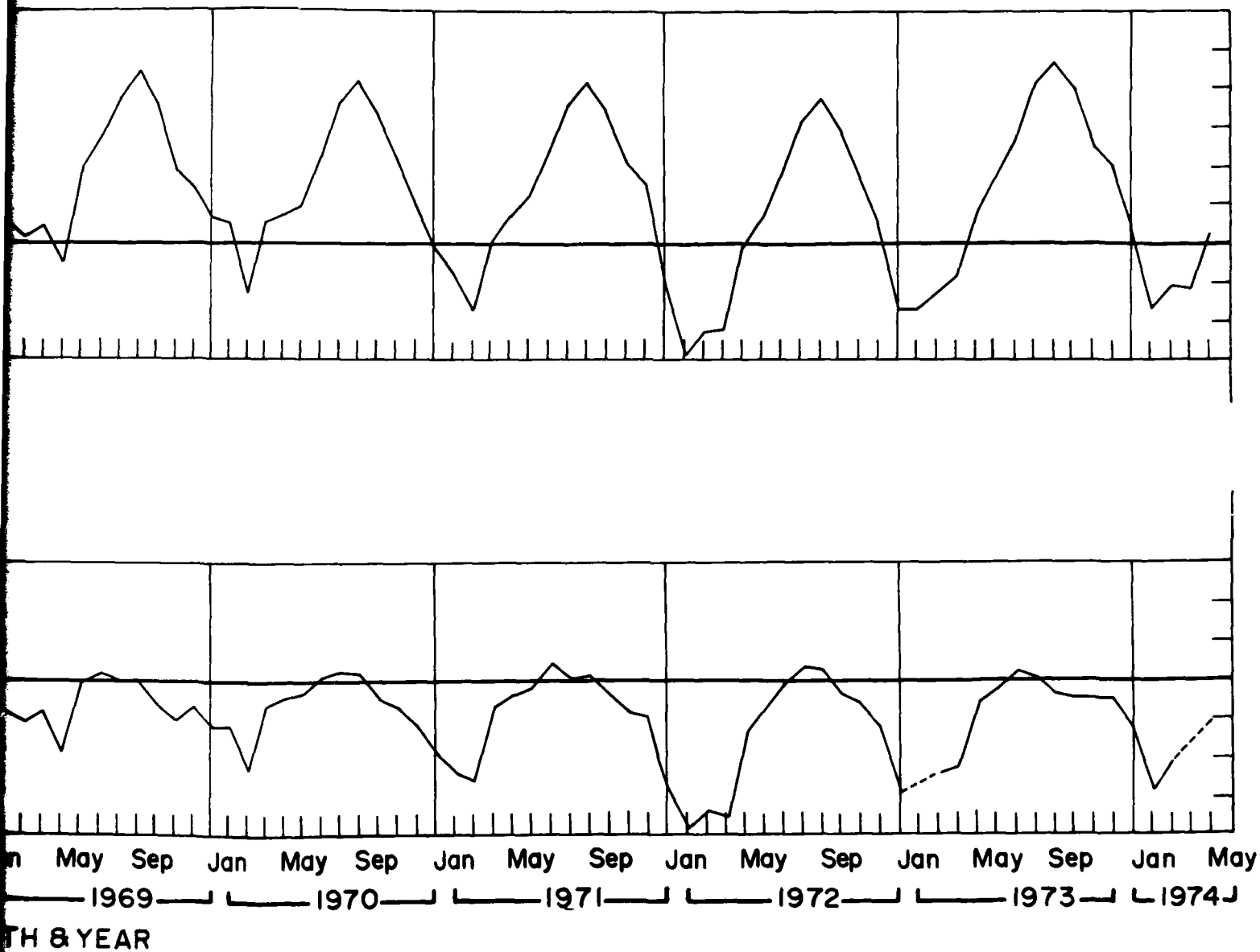


Table 1 Listing of all Oceanographic Cruises on OS BRAVO, 1964 - 1974.

CRUISE NO.	SHIP	DATES	NO. STA.	WDC REF. NO.
B-1	CDC CASCO	01/05/68-01/25/68	14	31-0521
B-2	CDC YARUTAT	02/22/68-03/07/68	11	31-0522
B-3	CDC CASTLEMOCK	03/30/68-04/18/68	16	31-0523
B-4	CDC COOK INLET	08/04/68-08/16/68	6	31-0194
B-5A	CDC CAMPBELL	09/09/68-09/27/68	3	31-0241
B-5B	CDC BIRB	12/01/68-12/14/68	7	31-0241
B-6	CDC CASCO	01/07/69-01/28/69	5	31-0398
B-7	CDC CASTLEMOCK	02/23/69-03/10/69	11	31-0398
B-8	CDC YARUTAT	03/13/69-03/26/69	12	31-0399
B-9	CDC MUMHOLDT	05/13/69-05/22/69	12	31-0564
B-10	CDC COOK INLET	06/27/69-07/14/69	12	31-0564
B-11	CDC ESCANABA	08/07/69-08/23/69	10	31-0573
B-12	CDC MENDOTA	10/11/69-11/01/69	10	31-0624
B-13	CDC MENDOTA	01/09/68-01/28/68	9	31-0719
B-14	CDC SPENCER	02/01/68-02/14/68	6	31-0879
B-15	CDC DUANE	02/24/68-03/13/68	8	31-0787
B-16	CDC MUMHOLDT	03/15/68-04/03/68	11	31-0787
B-17	CDC CASCO	04/29/68-05/20/68	11	31-0786
B-18	CDC OASCO	06/15/68-07/04/68	10	31-0795
B-19	CDC ABSECON	08/22/68-09/13/68	13	31-0795
B-20	CDC DUANE	10/08/68-10/28/68	13	31-0795
B-21	CDC CASTLEMOCK	11/02/68-11/27/68	13	31-0795
B-22	CDC MUMHOLDT	01/07/69-01/27/69	8	31-0879
B-23	CDC BIRB	02/24/69-03/14/69	24	31-0879
B-24	CDC ESCANABA	04/06/69-04/26/69	12	31-0887
B-25	CDC SPENCER	05/27/69-06/06/69	9	31-1063
B-26	CDC SEBAGO	06/29/69-07/23/69	22	31-1092
B-27	CDC MCCULLOCH	08/14/69-09/06/69	21	31-1157
B-28	CDC SPENCER	09/29/69-10/23/69	14	31-1174
B-29	CDC MENDOTA	11/16/69-11/29/69	10	31-1187
B-30	CDC CASCO	12/30/69-01/22/68	11	31-1199
B-31	CDC HAMILTON	02/14/68-03/08/68	9	31-1204
B-32	CDC CASTLEMOCK	03/31/68-04/23/68	11	31-1239
B-33	CDC MENDOTA	04/23/68-05/16/68	22	31-1263
B-34	CDC YARUTAT	05/18/68-07/01/68	14	31-1271
B-35	CDC COOK INLET	06/08/68-07/01/68	14	31-1271
B-36	CDC CHINOCUTEAGUE	07/01/68-07/24/68	17	31-1327
B-37	CDC MUMHOLDT	07/24/68-08/16/68	23	31-1327
B-38	CDC CASCO	08/10/68-09/08/68	17	31-1320
B-39	CDC MCCULLOCH	09/08/68-10/01/68	18	31-1341
B-40	CDC MUMHOLDT	10/01/68-10/24/68	20	31-1341
B-41	CDC MALFROOM	10/24/68-11/16/68	3	31-1343
B-42	CDC CASTLEMOCK	11/16/68-12/09/68	24	31-1373
B-43	CDC CHINOCUTEAGUE	12/09/68-01/01/69	7	31-1393
B-44	CDC CAMPBELL	01/01/69-01/23/69	11	31-1413
B-45	CDC CHASE	01/23/69-02/14/69	13	31-1413
B-46	CDC WOOTTELL	02/14/69-03/08/69	3	31-1401
B-47	CDC MUMHOLDT	03/08/69-03/31/69	4	31-1401
B-48	CDC COOK INLET	04/01/69-04/22/69	7	31-1401
B-49	CDC WOOTTELL	04/23/69-05/18/69	21	31-1401
B-50	CDC ABSECON	05/18/69-06/08/69	21	31-1401
B-51	CDC YARUTAT	06/08/69-07/01/69	46	31-1401
B-52	CDC OASCO	07/01/69-07/24/69	18	31-1492
B-53	CDC SHEPHERD	07/24/69-08/16/69	86	31-1492
B-54	CDC ANDRUSCOGGIN	08/16/69-09/08/69	34	31-1528
B-55	CDC INGHAM	09/08/69-10/01/69	15	31-1528
B-56	CDC ESCANABA	10/01/69-10/24/69	9	31-1545
B-57	CDC MONGENTHAU	10/24/69-11/16/69	14	31-1558
B-58	CDC CHINOCUTEAGUE	11/16/69-12/09/69	12	31-1558
B-59	CDC WOOTTELL	12/09/69-01/01/70	24	31-1572
B-60	CDC ABSECON	01/01/70-01/24/70	1	31-1572
B-61	CDC CAMPBELL	02/16/70-03/11/70	9	31-1598
B-62	CDC MCCULLOCH	03/11/70-04/03/70	11	31-1606
B-63	CDC MONGENTHAU	04/03/70-04/26/70	14	31-1615
B-64	CDC DUANE	04/26/70-05/19/70	15	31-1624
B-65	CDC ABSECON	05/19/70-06/11/70	43	31-1624
B-66	CDC GALLATIN	06/11/70-07/04/70	21	31-1624
B-67	CDC MENDOTA	07/04/70-07/27/70	19	31-1656
B-68	CDC WOOTTELL	07/27/70-08/11/70	13	31-1656
B-69	CDC SPENCER	08/11/70-09/04/70	13	31-1711
B-70	CDC COOK INLET	09/04/70-10/27/70	12	31-1711
B-71	CDC GALLATIN	10/27/70-11/18/70	24	31-1711
B-72	CDC CASTLEMOCK	11/18/70-12/11/70	15	31-1776
B-73	CDC BIRB	01/03/71-01/26/71	15	31-1782
B-74	CDC WOOTTELL	01/26/71-02/18/71	31	31-1823
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B-78	CDC SPENCER	04/28/71-05/21/71	9	31-1854
B-79	CDC SPENCER	05/21/71-06/13/71	18	31-1861
B-80	CDC INGHAM	06/13/71-07/06/71	10	31-1865
B-81	CDC OASCO	07/06/71-07/30/71	19	31-1874
B-82	CDC WOOTTELL	07/30/71-08/13/71	16	31-1874
B-83	CDC CAMPBELL	08/13/71-08/26/71	16	31-1921
B-84	CDC SEBAGO	08/26/71-10/04/71	17	31-1921
B-85	CDC HAMILTON	10/04/71-11/23/71	14	31-1925
B-86	CDC MONGENTHAU	11/23/71-12/19/71	8	31-1925
B-87	CDC ESCANABA	12/19/71-12/19/71	10	31-1921
B-88	CDC HAMILTON	12/19/71-01/14/72	6	31-1921
B-89	CDC SHEPHERD	01/14/72-02/09/72	14	31-1924
B-90	CDC DUANE	02/09/72-03/04/72	9	31-1976
B-91	CDC SHEPHERD	03/04/72-04/15/72	16	31-2031
B-92	CDC MONGENTHAU	04/15/72-05/09/72	35	31-2099
B-93	CDC ESCANABA	05/09/72-05/31/72	34	31-2031
B-94	CDC GALLATIN	05/31/72-06/24/72	32	31-2031
B-95	CDC WOOTTELL	06/24/72-07/19/72	16	31-2031
B-96	CDC INGHAM	07/19/72-08/24/72	17	31-2031
B-97	CDC INGHAM	08/24/72-09/23/72	43	31-2031
B-98	CDC WOOTTELL	09/23/72-10/17/72	6	31-2126
B-99	CDC SHEPHERD	10/17/72-11/12/72	25	31-2126
B-100	CDC HAMILTON	11/12/72-12/08/72	20	31-2126
B-101	CDC DUANE	12/08/72-01/02/73	12	31-2127
B-102	CDC HUNTO	01/02/73-01/26/73	2	31-2121
B-103	CDC TANEY	01/26/73-02/15/73	19	31-2121
B-104	CDC WOOTTELL	02/15/73-03/10/73	33	31-2121
B-105	CDC CHINOCUTEAGUE	03/10/73-04/02/73	32	31-2121
B-106	CDC SHEPHERD	04/02/73-04/25/73	15	31-2121
B-107	CDC OASCO	04/25/73-05/16/73	15	31-2121
B-108	CDC WOOTTELL	05/16/73-06/09/73	15	31-2121
B-109	CDC BIRB	06/09/73-07/01/73	21	31-2121
B-110	CDC DALLAS	07/01/73-07/25/73	21	31-2121
B-111	CDC DUANE	07/25/73-08/16/73	21	31-2121
B-112	CDC MENDOTA	08/16/73-09/07/73	23	31-2121
B-113	CDC SHEPHERD	09/07/73-09/27/73	30	31-2121
B-114	CDC BIRB	09/27/73-10/17/73	5	31-2121
B-115	CDC MONGENTHAU	10/17/73-11/06/73	11	31-2121
B-116	CDC HAMILTON	11/06/73-11/26/73	11	31-2121
B-117	CDC HAMILTON	11/26/73-12/16/73	8	31-2121
B-118	CDC HAMILTON	12/16/73-01/09/74	8	31-2121
B-119	CDC CHASE	01/09/74-01/30/74	3	31-2250
B-120	CDC INGHAM	01/30/74-02/20/74	5	31-2250
B-121	CDC GALLATIN	02/20/74-03/13/74	9	31-2341
B-122	CDC WOOTTELL	03/13/74-04/06/74	7	31-2341
B-123	CDC CHASE	04/06/74-05/16/74	17	31-2341
B-124	CDC HAMILTON	05/16/74-06/07/74	17	31-2341
B-125	CDC MONGENTHAU	06/07/74-06/30/74	3	31-2403

## APPENDIX A OCEANOGRAPHIC DATA LISTINGS

Table I.—USCGC CHINCOTEAGUE, 16 November 1969—9 December 1969, NODC Reference No. 31-1558.  
Table II.—USCGC BOUTWELL, 9 December 1969—1 January 1970, NODC Reference No. 31-8144.  
Table III.—USCGC ABSECON, 1 January 1970—24 January 1970, NODC Reference No. 31-1572.  
Table IV.—USCGC CAMPBELL, 16 February 1970—11 March 1970, NODC Reference No. 31-1598.  
Table V.—USCGC McCULLOCH, 11 March 1970—3 April 1970, NODC Reference No. 31-1606.  
Table VI.—USCGC MORGENTHAU, 3 April 1970—26 April 1970, NODC Reference No. 31-1615.  
Table VII.—USCGC DUANE, 26 April 1970—19 May 1970, NODC Reference No. 31-1624.  
Table VIII.—USCGC ABSECON, 19 May 1970—11 June 1970, NODC Reference No. 31-8169.  
Table IX.—USCGC GALLATIN, 11 June 1970—4 July 1970, NODC Reference No. 31-8172.  
Table X.—USCGC MENDOTA, 4 July 1970—27 July 1970, NODC Reference No. 31-1656.  
Table XI.—USCGC BOUTWELL, 19 August 1970—11 September 1970, NODC Reference No. 31-8179.  
Table XII.—USCGC SPENCER, 11 September 1970—4 October 1970, NODC Reference No. 31-1704.  
Table XIII.—USCGC COOK INLET, 4 October 1970—27 October 1970, NODC Reference No. 31-1711.  
Table XIV.—USCGC GALLATIN, 27 October 1970—18 November 1970, NODC Reference No. 31-8232.  
Table XV.—USCGC CASTLEROCK, 18 November 1970—11 December 1970, NODC Reference No. 31-1776.  
Table XVI.—USCGC BIBB, 3 January 1971—26 January 1971, NODC Reference No. 31-1782.  
Table XVII.—USCGC BOUTWELL, 26 January 1971—18 February 1971, NODC Reference No. 31-8253.  
Table XVIII.—USCGC CAMPBELL, 18 February 1971—13 March 1971, NODC Reference No. 31-1811.  
Table XIX.—USCGC ABSECON, 13 March 1971—5 April 1971, NODC Reference No. 31-8260.  
Table XX.—USCGC BOUTWELL, 5 April 1971—28 April 1971, NODC Reference No. 31-8259.  
Table XXI.—USCGC OWASCO, 28 April 1971—21 May 1971, NODC Reference No. 31-1854.  
Table XXII.—USCGC SPENCER, 21 May 1971—13 June 1971, NODC Reference No. 31-1861.  
Table XXIII.—USCGC INGHAM, 13 June 1971—6 July 1971, NODC Reference No. 31-1865.  
Table XXIV.—USCGC OWASCO, 6 July 1971—30 July 1971, NODC Reference No. 31-1879.  
Table XXV.—USCGC GALLATIN, 30 July 1971—25 August 1971, NODC Reference No. 31-8274.  
Table XXVI.—USCGC CAMPBELL, 25 August 1971—18 September 1971, NODC Reference No. 31-1913.  
Table XXVII.—USCGC SEBAGO, 18 September 1971—8 October 1971, NODC Reference No. 31-1921.  
Table XXVIII.—USCGC HAMILTON, 8 October 1971—3 November 1971, NODC Reference No. 31-8275.  
Table XXIX.—USCGC MORGENTHAU, 3 November 1971—29 November 1971, NODC Reference No. 31-1922.  
Table XXX.—USCGC ESCANABA, 29 November 1971—19 December 1971, NODC Reference No. 31-1923.  
Table XXXI.—USCGC HAMILTON, 19 December 1971—14 January 1972, NODC Reference No. 31-8281.  
Table XXXII.—USCGC SHERMAN, 14 January 1971—9 February 1972, NODC Reference No. 31-1924.  
Table XXXIII.—USCGC DUANE, 9 February 1971—4 March 1972, NODC Reference No. 31-1978.  
Table XXXIV.—USCGC SHERMAN, 24 March 1972—15 April 1972, NODC Reference No. 31-2031.

Table XXXV.—USCGC MORGENTHAU, 15 April 1972—9 May 1972, NODC Reference No. 31-8299.  
 Table XXXVI.—USCGC ESCANABA, 9 May 1972—31 May 1972, NODC Reference No. 31-8303.  
 Table XXXVII.—USCGC GALLATIN, 31 May 1972—24 June 1972, NODC Reference No. 31-8309.  
 Table XXXVIII.—USCGC BOUTWELL, 24 June 1972—18 July 1972, NODC Reference No. 31-8310.  
 Table XXXIX.—USCGC ANDROSCOGGIN, 18 July 1972—7 August 1972, NODC Reference No. 31-2077.  
 Table XL.—USCGC INGHAM, 7 August 1972—28 August 1972, NODC Reference No. 31-2081.  
 Table XLI.—USCGC BOUTWELL, 28 August 1972—23 September 1972, NODC Reference No. 31-8313.  
 Table XLII.—USCGC SPENCER, 23 September 1972—17 October 1972, NODC Reference No. 31-2126.  
 Table XLIII.—USCGC SHERMAN, 17 October 1972—12 November 1972, NODC Reference No. 31-8318.  
 Table XLIV.—USCGC HAMILTON, 12 November 1972—8 December 1972, NODC Reference No. 31-8319.  
 Table XLV.—USCGC DUANE, 8 December 1972—2 January 1973, NODC Reference No. 31-2127.  
 Table XLVI.—USCGC MUNRO, 26 January 1973—2 January 1973, NODC Reference No. 31-2121.  
 Table XLVII.—USCGC TANEY, 26 January 1973—15 February 1973, NODC Reference No. 31-2140.  
 Table XLVIII.—USCGC BOUTWELL, 15 February 1973—10 March 1973, NODC Reference No. 31-8336.  
 Table XLIX.—USCGC CHAUTAUQUA, 10 March 1973—2 April 1973, NODC Reference No. 31-8335.  
 Table L.—USCGC SHERMAN, 2 April 1973—25 April 1973, NODC Reference No. 31-8337.  
 Table LI.—USCGC OWASCO, 25 April 1973—18 May 1973, NODC Reference No. 31-8338.  
 Table LII.—USCGC CHAUTAUQUA, 18 May 1973—9 June 1973, NODC Reference No. 31-8339.  
 Table LIII.—USCGC BIBB, 9 June 1973—1 July 1973, NODC Reference No. 31-2205.  
 Table LIV.—USCGC DALLAS, 1 July 1973—25 July 1973, NODC Reference No. 31-8341.  
 Table LV.—USCGC DUANE, 25 July 1973—16 August 1973, NODC Reference No. 31-2209.  
 Table LVI.—USCGC MENDOTA, 16 August 1973—7 September 1973, NODC Reference No. 31-8342.  
 Table LVII.—USCGC SHERMAN, 7 September 1973—27 September 1973, NODC Reference No. 31-8356.  
 Table LVIII.—USCGC BIBB, 27 September 1973—17 October 1973, NODC Reference No. 31-2237.  
 Table LIX.—USCGC MORGENTHAU, 17 October 1973—6 November 1973, NODC Reference No. 31-8347.  
 Table LX.—USCGC HAMILTON, 6 November 1973—26 November 1973, NODC Reference No. 31-8349.  
 Table LXI.—USCGC BIBB, 26 November 1973—16 December 1973, NODC Reference No. 31-2243.  
 Table LXII.—USCGC CHASE, 16 December 1973—9 January 1974, NODC Reference No. 31-2270.  
 Table LXIII.—USCGC INGHAM, 9 January 1974—30 January 1974, NODC Reference No. 31-2269.  
 Table LXIV.—USCGC GALLATIN, 30 January 1974—20 February 1974, NODC Reference No. 31-8276.  
 Table LXV.—USCGC CAMPBELL, 20 February 1974—13 March 1974, NODC Reference No. 31-2341.  
 Table LXVI.—USCGC CHASE, 2 April 1974—24 April 1974, NODC Reference No. 31-8402.  
 Table LXVII.—USCGC HAMILTON, 24 April 1974—16 May 1974, NODC Reference No. 31-8368.  
 Table LXVIII.—USCGC BIBB, 16 May 1974—7 June 1974, NODC Reference No. 31-2394.  
 Table LXIX.—USCGC MORGENTHAU, 7 June 1974—30 June 1974, NODC Reference No. 31-8403.

## Codes Utilized

A complete description of the codes utilized in the tabulation of oceanographic station data can be found in National Oceanographic Data Center publication M-2, Processing Physical and Chemical Data from Oceanographic Stations. (Rev. August 1964, supplement issued May 1966.)

To facilitate use of the oceanographic station data listing, entry headings which are not self-explanatory are described below.

REFID .....	NODC reference identity number.
CONSEC .....	Consecutive station number.
BOTDP (B) .....	Uncorrected sounding depth in meters.
SHIP (B) .....	NODC assigned platform identity code.
DATA USE .....	Entry 1 identifies DNP data.
AREA .....	NODC ocean area code.
CLOUD T/A (B) .....	Cloud type according to WMO code 0500 and cloud amount according to WMO code 2700.
Wave observations	
DIR .....	Direction from which dominant waves are coming in tens of degrees according to WMO code 0885.
HGT .....	Height of dominant waves according to WMO code 1555.
PER .....	Period of dominant waves according to WMO code 3155.
SEA (B) .....	Sea state according to WMO code 3700.
CL/TR (B) .....	Water color according to fore-Ule code. Transparency in meters as determined by Secchi disc.
WIND DIR (B) .....	Direction from which wind is blowing in tens of degrees according to WMO code 0877.
WIND SPD (B) .....	Wind speed in knots.
WIND FOR (B) .....	Wind force in beaufort code.
WEATHER (B) .....	Weather code—If preceded by letter X is according to WMO code 4501. A numeric two digit entry indicates weather according to WMO code 4677.
INST .....	Instrument used for observation—"Nansen Cast" indicates station consists of Nansen cast data—"STD Recorder" indicates station consists of STD data or a mixture of STD and Nansen cast data.
TRACE DIR (B) .....	"Trace" indicator U (UP), D (DOWN), and A (AVERAGED)—used with STD casts, and specify that data were taken while hoisting or lowering respectively or that the two traces were averaged.
DURATION (B) .....	Time elapsed during raising or lowering of the STD recorder to tenths of hours.
ORIG (B) .....	Originator's reference number in two parts—cruise number or 3 characters (if year of cruise forms part of cruise number years digits may sometimes only be found in "Year" field), and station number.
TEN SQ .....	Ten-degree square—modified Canadian square number.
5 SQUARE .....	Five-degree squares—modified Canadian system.
2 SQUARE .....	Two-degree squares—modified Canadian system.
1 SQUARE .....	One-degree squares—modified Canadian system.
CASTNUM (B) .....	Number of cast on multicast stations (blank when messenger time is given).
TIME (B) .....	Time of release of messenger in hour and tenths for applicable observed levels. If multicast series extends past midnight, 24 hours are added to cast time of next day. Beginning time for STD is given at first obs depth.
LVLTP .....	Type of record at depth indicated. "OBS"—observed values. For STD recorder = level of data read-out. "STD"—NODC standard interpolated values. "ORG"—Standard or other depths carrying non-NODC interpolated values. "LIT"—Interpolated standard depth values used as obs for computational purposes. Note—When an observed level coincides with a STD depth level, both "STD" and "OBS" lines will appear.
DEPTH .....	Depth of sample (or standard level) in whole meters. Prefix "T" indicates thermometrically determined depth (depth of unprotected thermometers). Subscript "Q" indicates that the value is marked doubtful by the originator. A value designated as implausible by NODC is marked with a "P". Postscript "Z" indicates uncorrected and inaccurate "Wire-out" depths (high wire angle present).
TEMP (B) .....	Temperature in degrees celsius. For "Q" and "P" notation see depth field.
SAL (B) .....	Salinity in parts per thousand. For "Q" and "P" notation see depth field.
SIGMA-T (B) .....	Seawater density anomaly to 2 decimal places. When depth, temp, or salinity is doubtful, a "Q" is suffixed. An asterisk indicates a decrease of 0.02 or more from the previous level.
DYNDPTH .....	Dynamic depth anomaly in dynamic meters to millimeters.
SND VEL (B) .....	Sound velocity in meters per second to decimeters according to Wilson's formula. (A standard depth-pressure term is used for stations not beginning at the surface).
OXYG (B) .....	Oxygen in ML/L to hundredths.

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